The need to move from mastering to coping with climate uncertainties

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“If a single motif could capture realities in today’s world, <u>uncertainty</u> – and the complexity, which underlies it - would be a likely candidate”

Mehta et al, 2001: 1

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Outline

1. **Theory**
   - How are climate uncertainties conceptualized in the scientific and policy discourse?
2. **Empirics**
   - How are climate uncertainties handled in current local climate change adaptation policymaking?
3. **Conclusion**
   - Some preliminary suggestions on how uncertainties can be conceptualized and handled in a different way in order to achieve a more effective climate change adaptation policy

The “uncertainty reductionism problem”

Risk

We know what we don’t know, probabilities of outcomes can be calculated

Uncertainty

We don’t know what we don’t know, probabilities of outcomes can not be calculated

Knight 1921; Douglas 1985

We should always try to reduce uncertainties to risks
“Where probabilities cannot be derived from empirical data, systematic procedures have been developed for eliciting what are called ‘subjective probabilities’ from experts” (Morgan and Henrion, 1990; Moss and Schneider, 2000, citation from Lampert et al, 2004: 2).

We are not always able to reduce uncertainties to risks

“Interactions within and between processes and systems constantly generate unpredictable outcomes and surprises; the result is a world which is inherently less predictable and knowable. In this context, conventional models which have guided the study of environment and development interventions, based on notions of equilibrium and predictability, fail to hold up” (Mehta et al, 2001: 1, our underlining)

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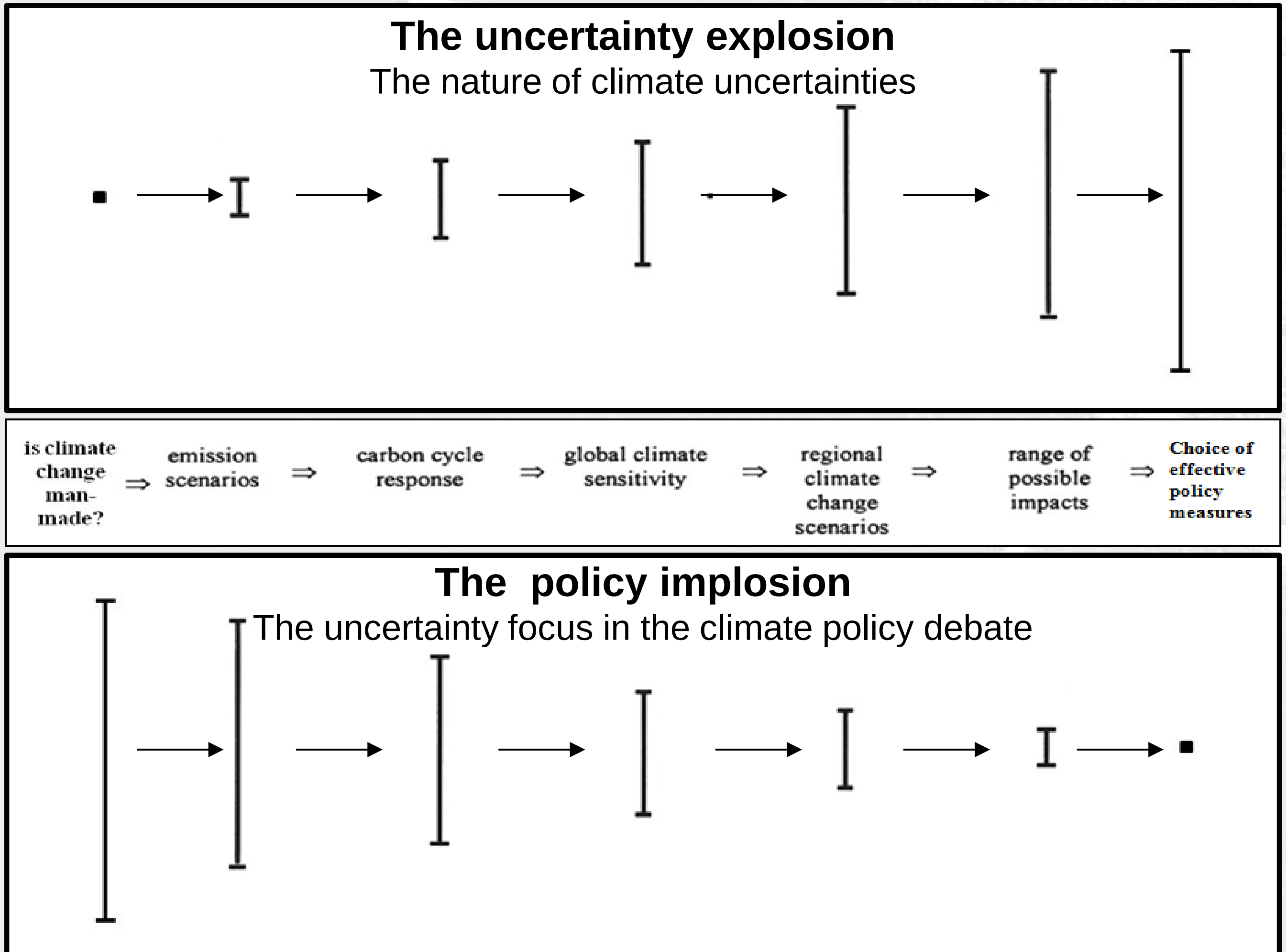
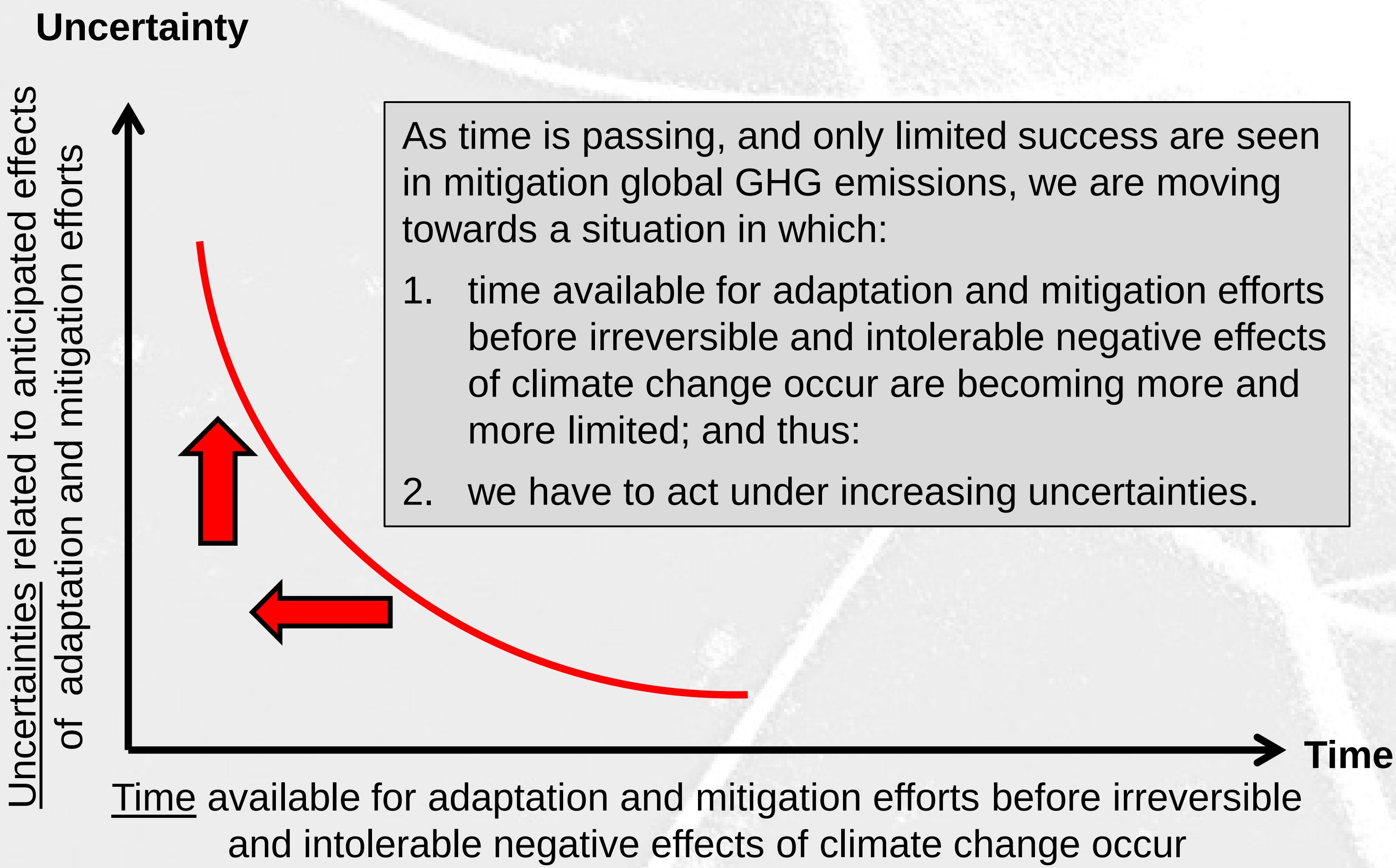
The “uncertainty paradox”



Adopted from Schneider, 1983; Jones, 2000; Schneider and Kuntz-Duriseti, 2002

The "uncertainty time squeeze"



As time is passing, and only limited success are seen in mitigation global GHG emissions, we are moving towards a situation in which:

1. time available for adaptation and mitigation efforts before irreversible and intolerable negative effects of climate change occur are becoming more and more limited; and thus:
2. we have to act under increasing uncertainties.

Two opposing alternatives on how to relate to climate uncertainties

Alternative 1: The normal attitude

“The <u>first</u> option is to reduce the uncertainty through data collection, research, modeling, simulation, and so forth. This effort is characteristic of <u>normal scientific study</u>…. “

“However, the daunting uncertainty surrounding global environmental change and the need to make decisions before the uncertainty is resolved make the first option difficult to achieve”.

Alternative 2: The alternative approach

“That leaves policymakers an alternative: to manage uncertainty rather than master it. Thus, the <u>second</u> option is to <u>integrate uncertainty into policymaking</u>.”

Schneider and Kuntz-Duriseti, 2002: 54 (our underlining)

1. **Theory**
   - How are climate uncertainties conceptualized in the scientific and policy discourse?
2. **Empirics**
   - How are climate uncertainties handled in current local climate change adaptation policymaking?
   - **Case: Surface water management in Norwegian municipalities**
3. **Conclusion**
   - Some preliminary suggestions on how uncertainties can be conceptualized and handled in a different way in order to achieve a more effective climate change adaptation policy

Empirical basis

- **The project "Community Adaptation and Vulnerability in Norway" (NORADAPT; 2006-11)**
  - Experiences gained from working together with 9 municipalities in four years on developing and implementing methods for analysing climate change vulnerability and developing climate change adaptation strategies

(Aall, 2011; Dannevig et al, 2012a; 2012b)

Ongoing

- **The project "Spatial planning and preparedness for a changing climate (AREALKLIMA; 2012-14)**
  - Historical analysis of 10 historic natural hazard events and analyse possible causes for damage to occur

(Groven et al, 2013)

- **The project "Buildings and Infrastructure - Vulnerability and Adaptive Capacity to Climate Change" (BIVUAC; 2010-14)**
  - Study (national survey combined with 4 local case studies) how climate uncertainties are handled in local land use planning and surface water treatment

(Groven, 2013)

Background: Increased vulnerabilities due to the combined effects of climatic and societal change

- **Climate change**
  - Leading to increased precipitation, precipitation intensity and snow melting
- **Institutional constraints in local surface water management**
  - Urbanization leading to an increase of impermeable surfaces, closed drains and narrowing of river courses
  - An increasing maintenance backlog
- **Institutional constrains in local land-use planning**
  - Privatisation of land-use planning and downsizing of in-house local government planning capacity
  - De-institutionalisising of a previous environmental policy reform

Standard approach in adapting to climate change in surface water management

- **Characteristics of current approach to local surface water management**
  - Under-ground water pipes
  - The use of local IDF curves (intensity, duration, frequency) for dimensioning water pipes
  - Design of surface water systems subordinate to land-use planning
- **Climate change adaptation**
  - Urge for climate scenarios that allows for producing IDF curves with a time resolution of a few minutes, but….
  - …current climate scenarios have a time resolution of approximatly 1 hour…
  - ..thus: ”it is questionable if it is possible to establish formal and quantifiable uncertainty estimate changes of high resolution precipitation variables even at the [regional] scale” (Arnbjerg-Nielsen 2012)

Alternative approach in adapting to climate change in surface water management

- **Planning decisions outrule climate change regarding impact on future runoff**
  - Development of a pristine area may increase runoff intensities by up to +500 % due to reduced infiltration…
  - …. whereas climate change in the western part of Norway may increase runoff only by +20-50%
- **Sustainable drainage systems (SUDS)**
  - Drain surface water at low environmental and economic cost, e.g through soil infiltration and retaining water in vegetation belts and balancing ponds
  - Reduces overall load and peak flows on conventional drains

The Bergen case - a Norwegian pioneer

- **Design of surface water systems to be done prior to final decision on land-use plan**
  - The City of Bergen was first to make surface water planning a mandatory part of all land-use planning activities
- **The agenda-setting process**
  - 20 years of advocacy for new surface water management principles within the Water and sewage department
  - The shift was triggered off by an extreme weather event in 2005
  - Still, the new regime was introduced with no references to climate change, but was reframed into a climate change context at a later stage (in 2007)

(Groven, 2013)

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Two main critiques of the current scientific and policy discourse on climate uncertainties

- **How to describe climate uncertainties**
  - “More focus is needed on uncertainties generated by human actions“

    (Ekwurzel, and McCarthy, 2011)
  - “Knowledge and ecological uncertainties attained too much attention at the expense of livelihood and social and political uncertainties”

    (Dessai et al, 2007)
- **How to relate to climate uncertainties**
  - “More focus is needed on making uncertainty analysis tailor-made for decision support”

    (Moss, 2007)

A suggested way to meet these critiques

How to describe climate uncertainties	**Narrow perspective** (Focusing on ecological uncertainties)	**Wide perspective** (Including other locations of uncertainty)
How to relate to climate uncertainties	**Mastering uncertainties** (Believing that all climate uncertainties can be reduced to risks)	**Managing uncertainties** (Accepting that some uncertainties we have to live with)

A suggested typology of uncertainties

- **How to describe uncertainties**
  - Ecological : Uncertainties embedded in abiota (e.g. the "climate") and biota (eco-systems)
  - Livelihood : Uncertainties relating to the broader ecological, economic and social processes that create for local livelihoods
  - Social and political : Uncertainties relating to changes in socio-political configurations and multiple forms of political action or development intervention
- **How to relate to uncertainties**
  - Predict-then-act: Wait with adaptation until uncertainty is reduced and the future can be predicted
  - Reflect-then-act : Reflect on type of uncertainty present, and then adapt under uncertainty

Typology inspired by Mehta et al, 2001; Lampart et al, 2004; Dessai and van der Sluijs, 2007; Dessai et al, 2009

The way we analyze and address climate uncertainties govern the content and output of our climate change adaptation policies

	Predict-then-act	Reflect-then-act
Ecological uncertainties	Increased probability of wait-and-see or doing only reactive adaptation measures. More prominent at the national level of government.	
Livelihood uncertainties		
Social and political uncertainties		Increased probability of action and doing proactive and transformative measures. More prominent at the local level of government.

Final comment…..

- "Uncertainty …needs to be understood not only in terms of processes and practices in social life and resource use, but also as a concept that can be created and deployed strategically by different actors……<u>Whether one should attempt to reduce [uncertainty] or not should be seen as part of intensely political processes</u>"

Mehta et al, 2001: 8

References (1)

Aall, C. (2012): The early experiences of local climate change adaptation in Norwegian municipalities compared with that of Local Agenda 21 and climate change mitigation, Local Environment: The International Journal of Justice and Sustainability, 17:6-7, 579-595

Böhringer, C., Finus, M., Vogt, C. (eds) (2002): Controlling Global Warming: Perspectives from Economics, Game Theory, and public choice. Cheltenham: Edward Elgar Publishing Limited.

Dannevig, H, Rauken, T. Hovelsrud, G.K., (2012a). Implementing adaptation to climate change at the local level. The International Journal of Justice and Sustainability, 17:6-7, 597-611

Dannevig, H., Hovelsrud, G.K., Husabø, I. A. (2012b): Driving the agenda for climate change adaptation in Norwegian municipalities, Environment and Planning C: Government and Policy (accepted for publication)

Dessai, S., Hulme, M. (2004): "Does climate adaptation policy need probabilities? Climate Policy, Volume 4, Issue 2: 107-128

Dessai, S., van der Sluijs, J. (2007): Uncertainty and Climate Change Adaptation - a Scoping Study. Report NWS-E-2007-198, Utrecht: Copernicus Institute for Sustainable Development and Innovation, University of Utrecht.

Douglas, M. (1985) *Risk Acceptability According to the Social Sciences, London: Routledge & Kegan*

Ekwurzel, B., Frumhoff, P.C. & McCarthy, J.J. (2011). Climate uncertainties and their discontents: increasing the impact of assessments on public understanding of climate risks and choices. *Climatic Change 108,* 791–802.

Groven, K. (2013): Eit politisk skred: Korleis naturskadeførebygging og klimatilpassing kom på dagsorden i Bergen kommune. I Bye, L.M., Lein, H., Rød, J.K. (2013): *Mot en farligere fremtid? Om klimaendringer, sårbarhet og tilpasning i Norge*. Trondheim: Tapir Akademisk Forlag, under produksjon.

Groven, K., Breivik, R., Dannevig, H., Aall, C. (2013): *About the AREALKLIM project*. Poster presented at the European Climate Change Adaptation Conference 2013: "Integrating Climate into Action". Hamburg, March 18-20 2013.

Jaeger, C., Renn, O., Rosa, E., and Webler, T.: 1998, 'Decision Analysis and Rational Action', in Rayner, S. and Malone, E. L. (eds.), *Human Choice and Climate Change, Vol. 3, Battelle Press,* Columbus, OH, pp. 141–216.

Jones, R. N., 2000: "Managing uncertainty in climate change projections– Issues for impact assessment, an Editorial Comment," Climate Change, 45 (3–4): 403–419.

References (2)

Knight, F.H. (1921) *Risk, Uncertainty and Profit*, Chicago: Chicago University Press

Lempert, R., Nakicenovic, N., Sarewitz, D., Schlesinger, M. (2004): Characterizing climate-change uncertainties for decision-makers. *Climatic Change,* 65: 1–9

Mehta, L., Leach, M., Scoones, I. (2001): *Editorial: Environmental Governance in an Uncertain World,* IDS Bulletin 32.4, 2001, Institute of Development Studies 2001

Morgan, M. G., Henrion, M.: 1990, *Uncertainty: Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis,* Cambridge University Press, Cambridge, UK.

Moss, R. H., Schneider, S. H.: 2000, 'Uncertainties in the IPCC TAR: Recommendations to Lead Authors for More Consistent Assessment and Reporting', in Pachuani, R., Tanaka, K. and Taniguchi, T. (eds.), *Guidance Papers on the Cross Cutting Issues of the Third Assessment Report of the IPCC, Intergovernmental Panel on Climate Change*, Geneva,pp. 33–51.

Renn, O., Dreyer, M., Klinke, A., Losert, C. (2003): "Risk Analysis According to the Precautionary Principle" in Renn, O./Müller-Herold, U./Stirling, A./Dreyer, M./Klinke, A./Losert, C./Fisher, E./Morosini, M./van Zwanenberg, P.: *The Application of the Precautionary Principle in the European Union,* Stuttgart: Center of Technology Assessment.

Schneider, S. H, Kuntz-Duriseti, K. (2002): "Uncertainty and Climate Change Policy", in: Schneider, S. H, Rosencranz, A., Nilse, J.O. (eds) (2002): *Climate Change policy: A Survey*. Washington DC: Island Press.

Schneider, S. H., (1983): CO2, climate and society: a brief overview, in R. S. Chen, E. Boulding, and S. H. Schneider (eds.), *Social Science Research and Climate Change: An Interdisciplinary Appraisal* (Boston: D. Reidel), pp. 9–15.

Stoft, S. E. (2010): Game Theory for Global Climate Policy (April 26, 2010). Global Energy Policy Center Research Paper No. 10-04: http://ssrn.com/abstract=1596273 or http://dx.doi.org/10.2139/ssrn.1596273

Swart, R., Bernstein, L., Ha-Duong, M., Petersen, A. (2009): Agreeing to disagree: uncertainty management in assessing climate change, impacts and responses by the IPCC, *Climatic Change*, 92:1–29

Walker, W.E., Harremoës, P., Rotmans, J,m van der Sluijs, J.P., van Asselt, M.B.A., Janssen, P.H.M., von Krauss, M.P.K. (2003): Defining uncertainty: a conceptual basis for uncertainty management in model-based decision support. *Integrated Assessment* 4, 5-17.

Webster, M., Forest, C., Reilly, J., Babiker, M., Kicklighter, D., Mayers, M., Prinn, R., Sarofim, M., Sokolov, A., Stone, P., Wang, C. (2003), "Characterizing climate-change uncertainties", *Climatic Change* 61: 295–320

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Thank you for your attention!

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